

WHAT IS CLAIMED IS:

1. A method for manufacturing a semiconductor device, comprising:
 - forming semiconductor film on an insulating surface;
 - 5 adding a metal element for promoting crystallization to the amorphous semiconductor film;
 - heating the amorphous semiconductor film to form a crystallized semiconductor film;
 - irradiating a continuous wave laser beam to the crystallized
 - 10 semiconductor film; and
 - removing an upper portion of the crystallized semiconductor film to which the continuous wave laser beam is irradiated.
2. A method according to claim 1, wherein the upper portion is a region
- 15 including the metal element.
3. A method for manufacturing a semiconductor device, comprising: ✓
 - forming semiconductor film on an insulating surface;
 - adding a metal element for promoting crystallization to the amorphous
 - 20 semiconductor film;
 - heating the amorphous semiconductor film to form a crystallized semiconductor film;
 - irradiating a continuous wave laser beam to the crystallized semiconductor film; and
 - 25 removing an upper portion of the crystallized semiconductor film to reduce a concentration of the metal element in the crystallized semiconductor film to a lower detection limit of SIMS (secondary ion mass spectroscopy).
4. A method according to claim 3, wherein the upper portion is a region
- 30 including the metal element.

5. A method according to claim 3, wherein the lower detection limit of SIMS (secondary ion mass spectroscopy) is $1 \times 10^{17} / \text{cm}^3$.

5 6. A method according to claim 1, wherein the upper portion is removed by one of wet etching, dry etching, and CMP (Chemical Mechanical Polishing).

 7. A method according to claim 4, wherein the upper portion is removed by one of wet etching, dry etching, and CMP (Chemical Mechanical Polishing).

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 8. A method according to claim 1, wherein the continuous wave laser beam is emitted from one of continuous wave Nd:YAG laser, continuous wave Nd:YVO₄ laser, continuous wave Nd:YLF laser, continuous wave Nd:YAlO₃ laser, continuous wave glass laser, continuous wave ruby laser, continuous wave alexandrite laser, and
15 continuous wave Ti:sapphire laser.

 9. A method according to claim 4, wherein the continuous wave laser beam is emitted from one of continuous wave Nd:YAG laser, continuous wave Nd:YVO₄ laser, continuous wave Nd:YLF laser, continuous wave Nd:YAlO₃ laser, continuous wave
20 glass laser, continuous wave ruby laser, continuous wave alexandrite laser, and continuous wave Ti:sapphire laser.

 10. A method according to claim 8, wherein the continuous wave laser beam is second harmonic or third harmonic.

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 11. A method according to claim 9, wherein the continuous wave laser beam is second harmonic or third harmonic.

 12. A method according to claim 1, wherein the continuous wave laser beam
30 is emitted from one of continuous wave Ar laser and continuous wave Kr laser.

13. A method according to claim 4, wherein the continuous wave laser beam is emitted from one of continuous wave Ar laser and continuous wave Kr laser.

5 14. A method for manufacturing a semiconductor device, comprising:
 forming semiconductor film on an insulating surface;
 adding a metal element for promoting crystallization to the amorphous
semiconductor film;
 heating the amorphous semiconductor film to form a crystallized
10 semiconductor film;
 irradiating a continuous wave laser beam to the crystallized
semiconductor film; and
 using CMP to remove an upper portion of the crystallized
semiconductor film to which the continuous wave laser beam is irradiated.

15 15. A method according to claim 14, wherein the upper portion is a region
including the metal element.

20 16. A method according to claim 14, wherein the continuous wave laser beam
is emitted from one of continuous wave Nd:YAG laser, continuous wave Nd:YVO₄ laser,
continuous wave Nd:YLF laser, continuous wave Nd:YAlO₃ laser, continuous wave
glass laser, continuous wave ruby laser, continuous wave alexandrite laser, and
continuous wave Ti:sapphire laser.

25 17. A method according to claim 16, wherein the continuous wave laser beam
is second harmonic or third harmonic.

30 18. A method according to claim 14, wherein the continuous wave laser beam
is emitted from one of continuous wave excimer laser, continuous wave Ar laser, and
continuous wave Kr laser.